



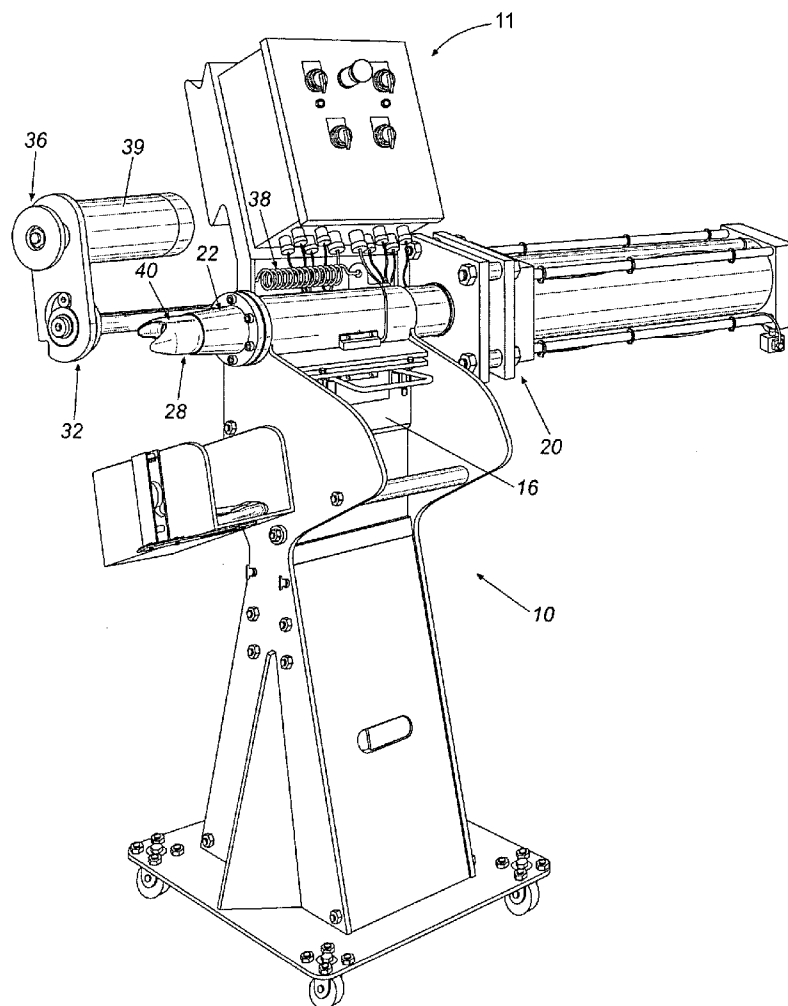
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Curles et al.(10) **Pub. No.: US 2007/0201753 A1**(43) **Pub. Date: Aug. 30, 2007**(54) **SAMPLE SIZER FOR FIBROUS
SUBSTANCES****Publication Classification**(76) Inventors: **Curtis Thomas Curles**, Cordele, GA
(US); **Christopher David Whittle**,
Cordele, GA (US)(51) **Int. Cl.**
B65B 13/02 (2006.01)(52) **U.S. Cl.** **382/234; 100/3**

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SCARBOROUGH, LLP
1320 MAIN STREET, 17TH FLOOR
COLUMBIA, SC 29201 (US)**(57) **ABSTRACT**

A device for sizing a sample of a fibrous substance including a first compression chamber with a first longitudinal axis, a first ram disposed in the first compression chamber, a second compression chamber disposed adjacent the first compression chamber, including a second longitudinal axis that is transverse to the first longitudinal axis, the second compression chamber being configured such that a front surface of the first ram forms a portion of the second compression chamber, a second ram disposed in the second compression chamber with a first cross-section that is complimentary to a cross-section of the second compression chamber, an extrusion nozzle adjacent the second compression chamber, wherein the sample is produced by causing a first compression stage in the first compression chamber.

(21) Appl. No.: **11/707,344**(22) Filed: **Feb. 16, 2007****Related U.S. Application Data**(60) Provisional application No. 60/773,957, filed on Feb.
16, 2006.

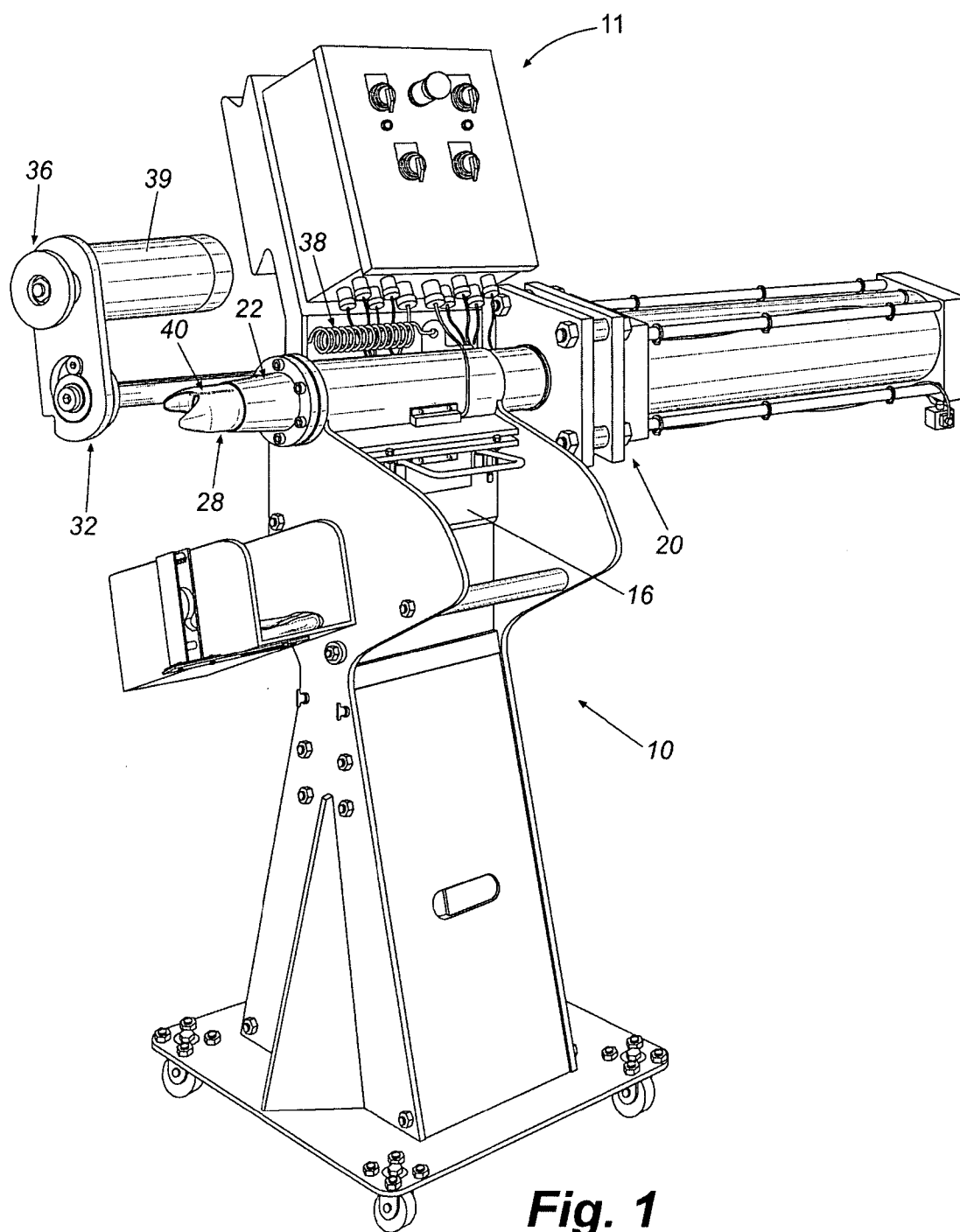
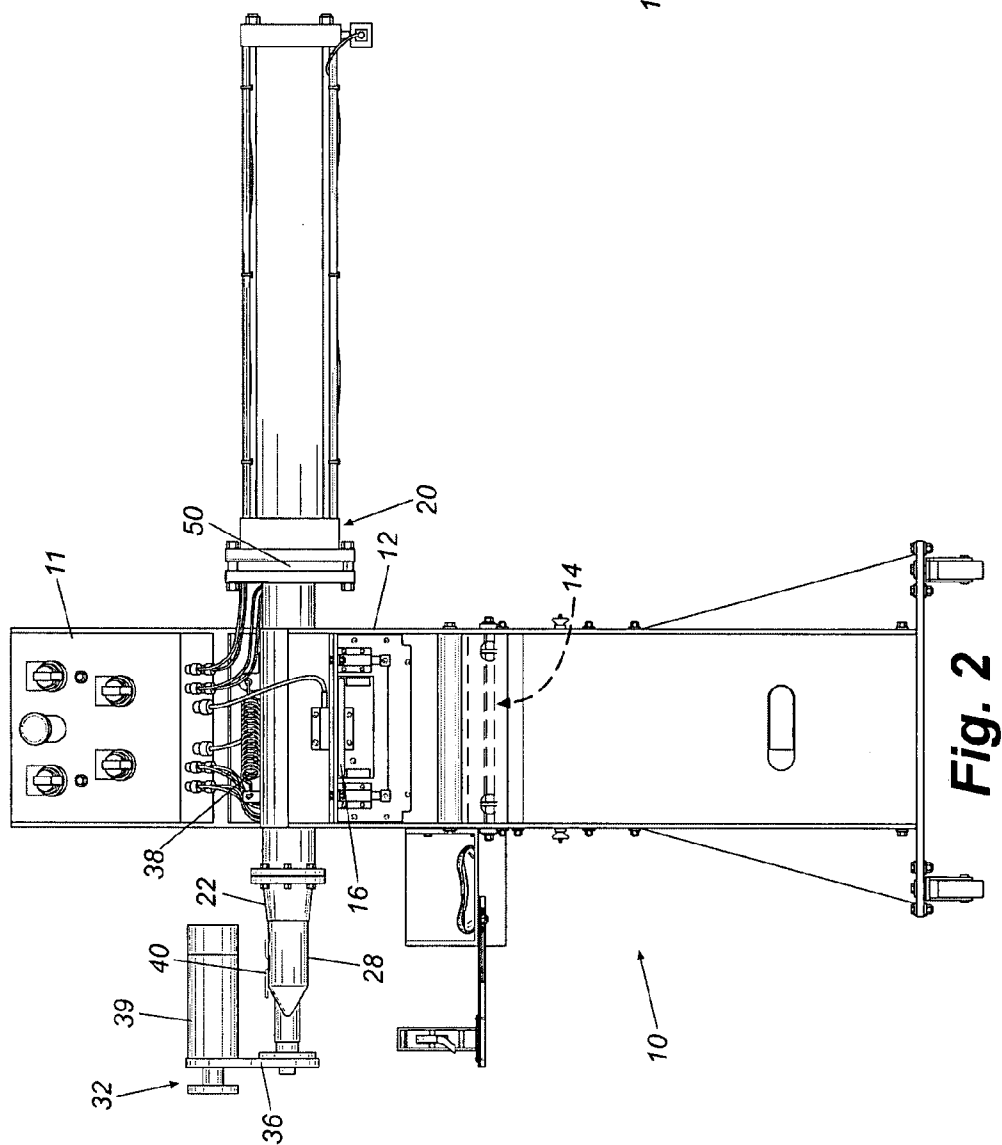
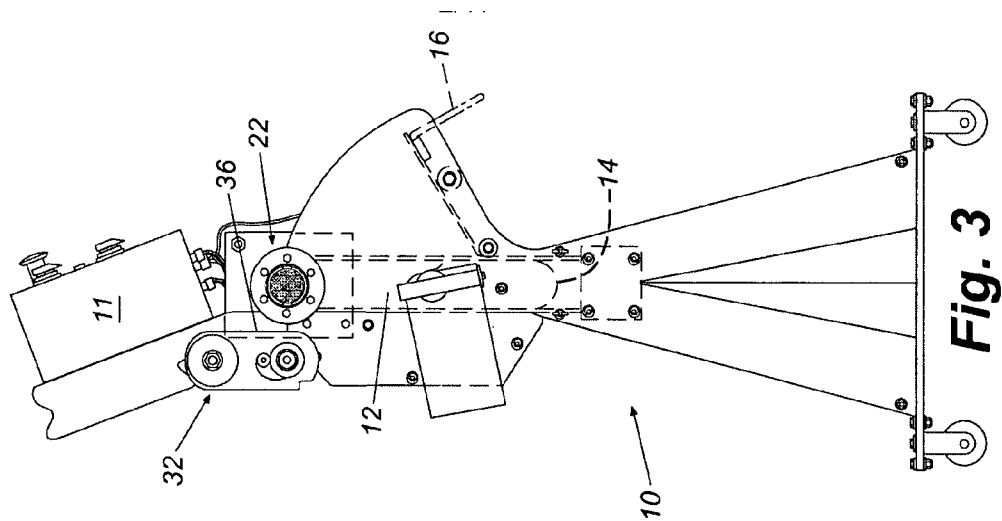


Fig. 1



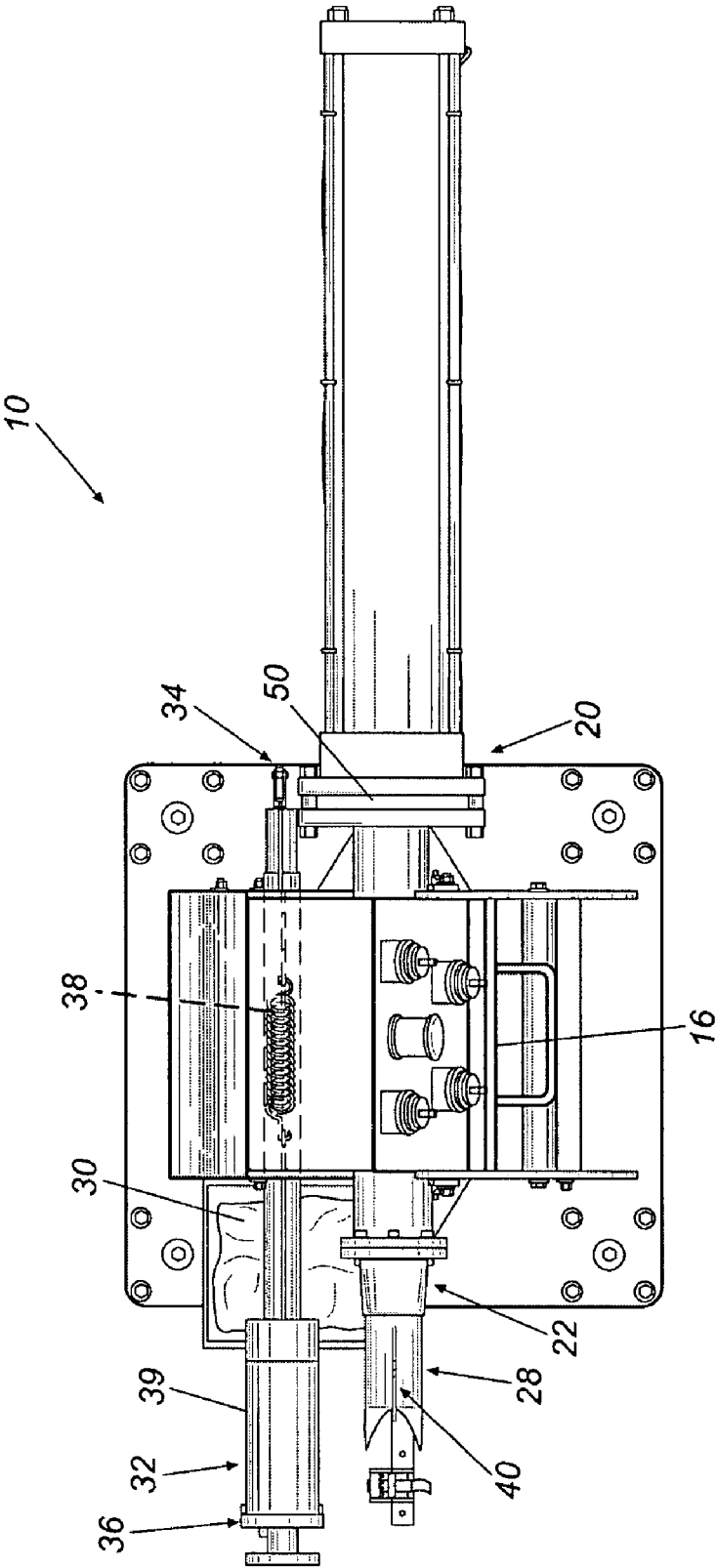


Fig. 4

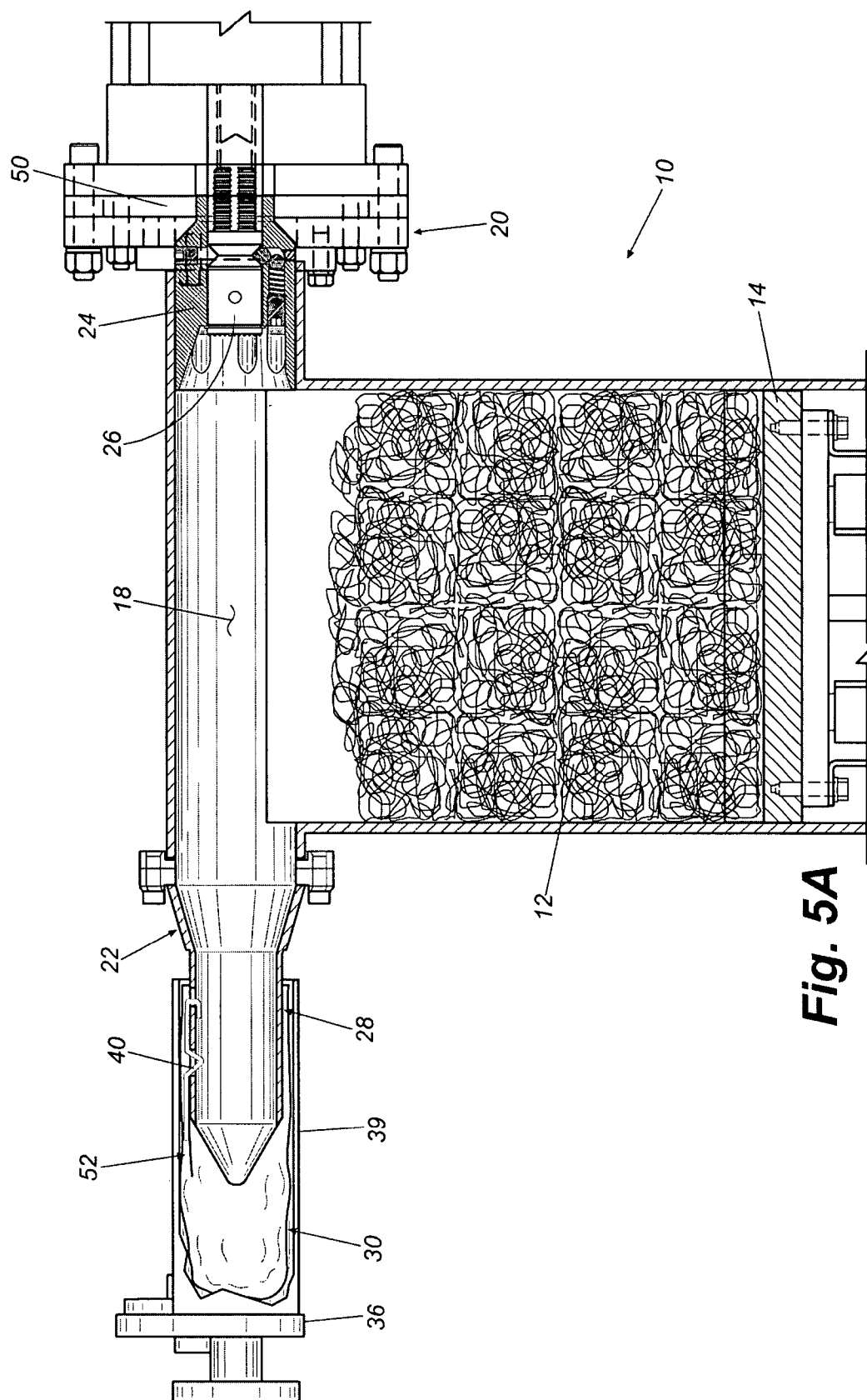


Fig. 5A

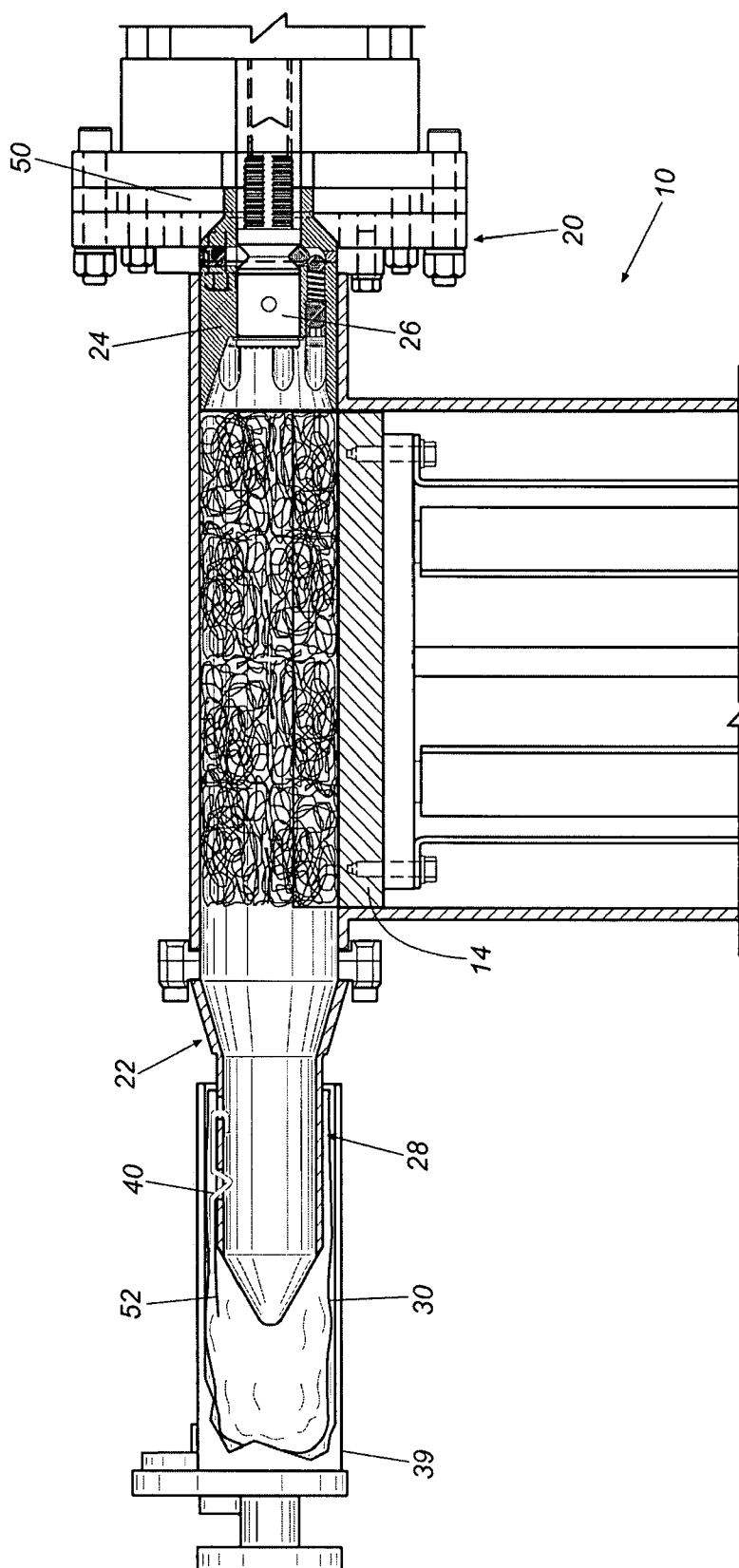


Fig. 5B

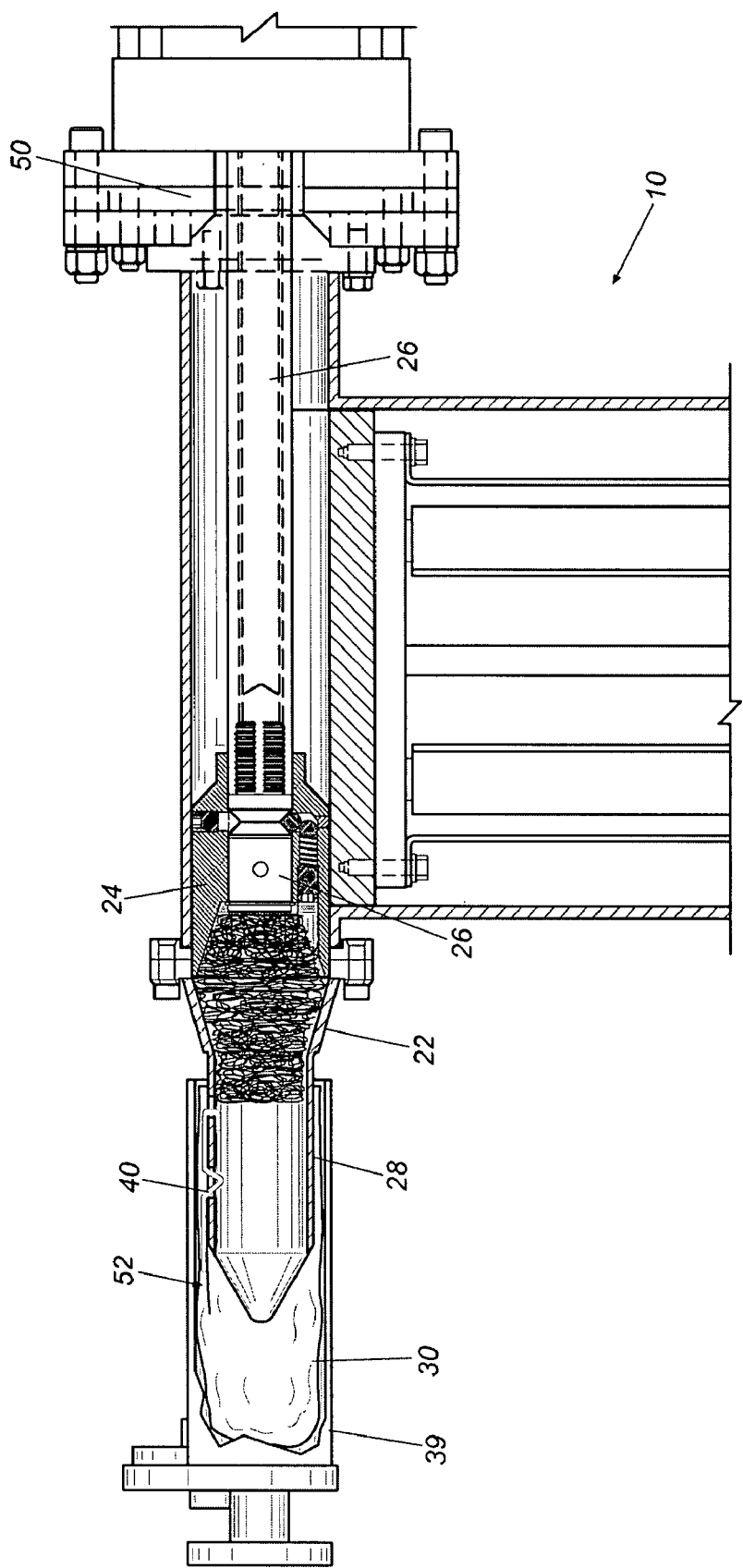


Fig. 5C

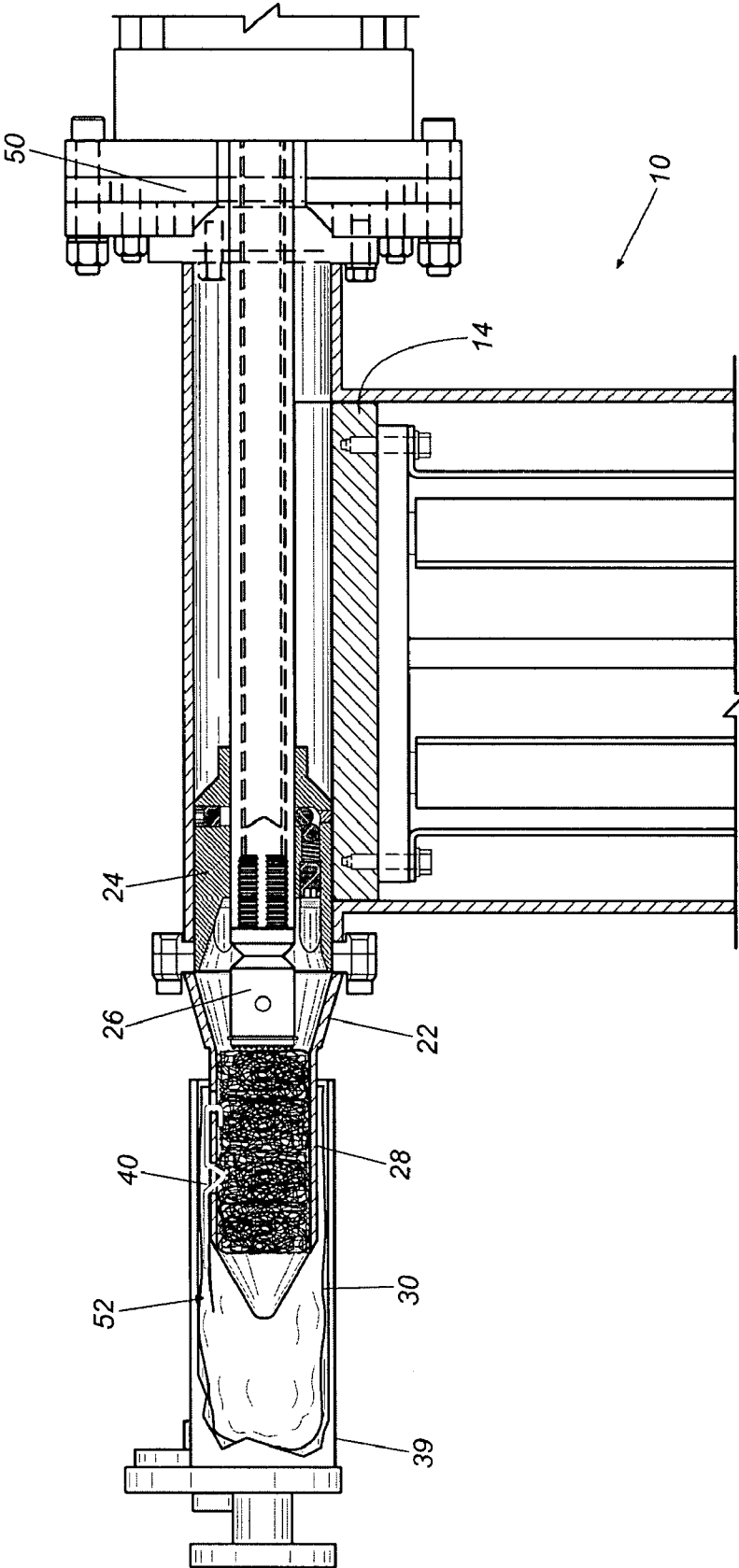


Fig. 5D

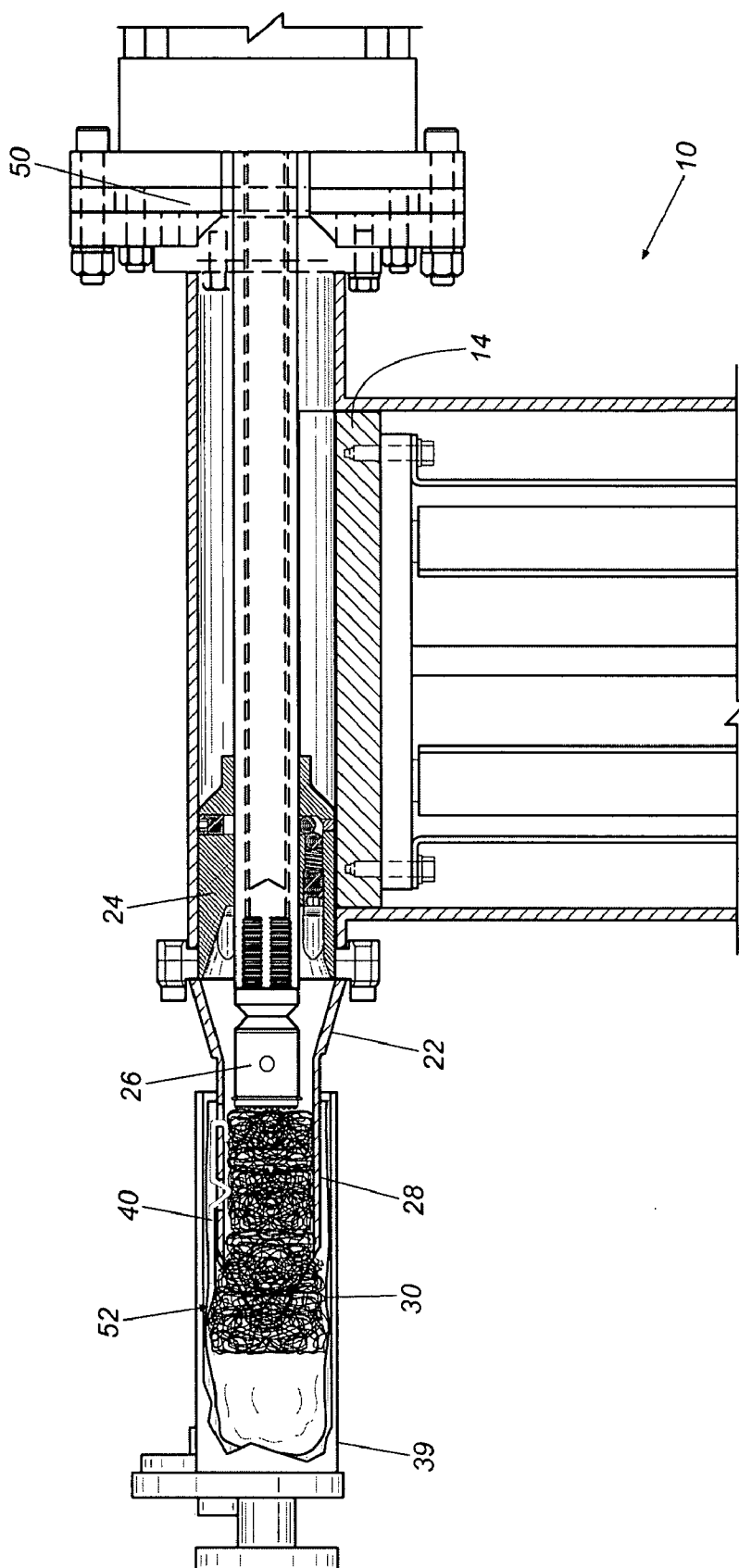


Fig. 5E

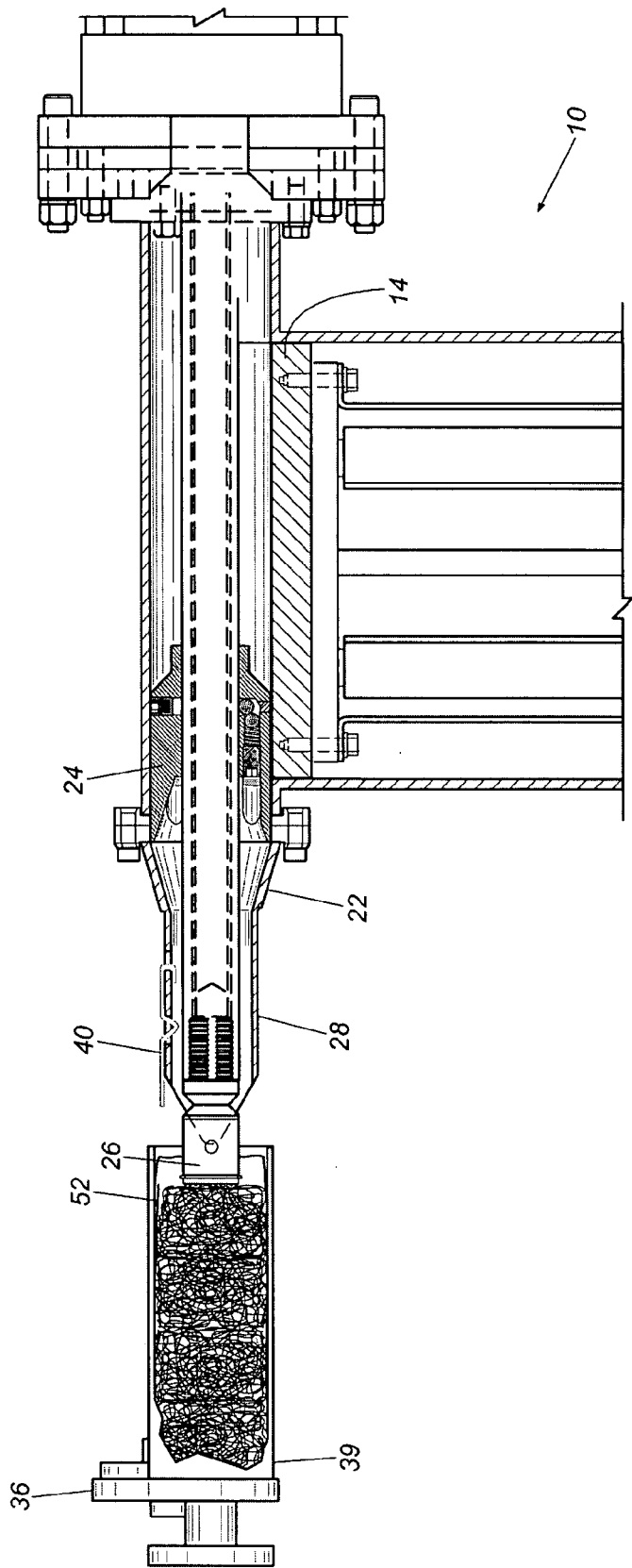


Fig. 5F

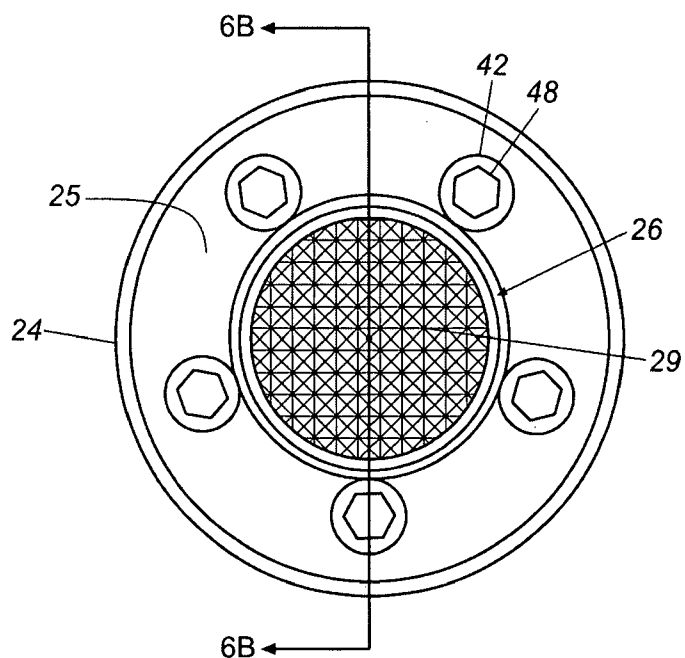


Fig. 6A

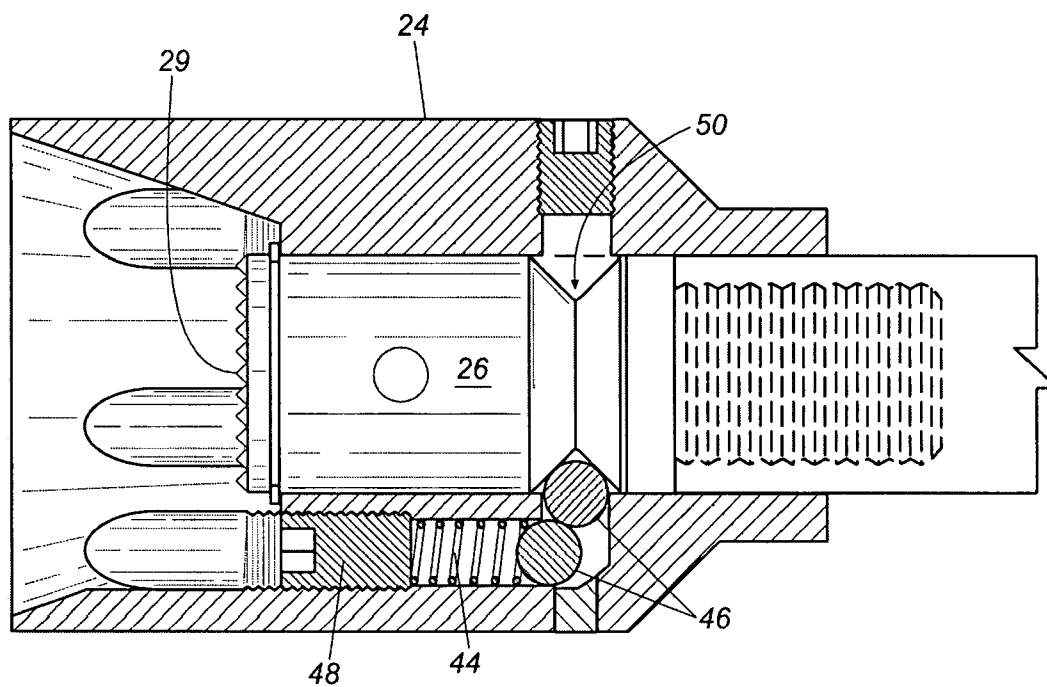


Fig. 6B

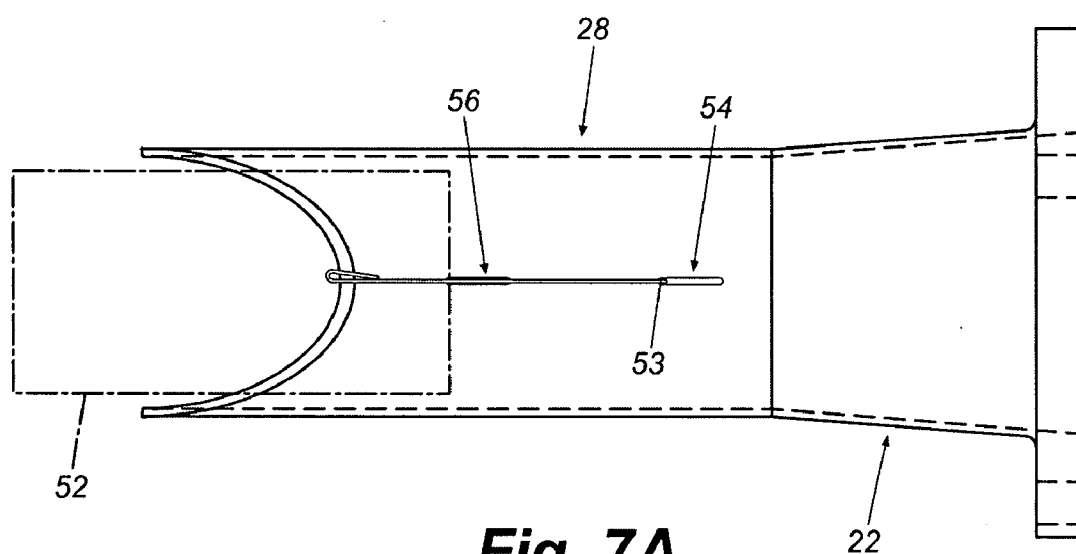


Fig. 7A

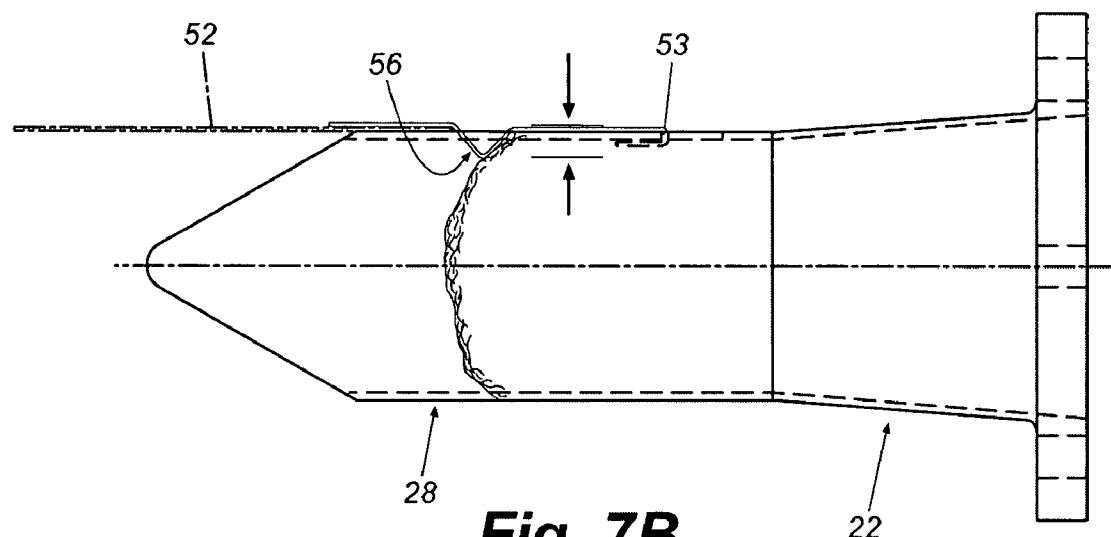


Fig. 7B

SAMPLE SIZER FOR FIBROUS SUBSTANCES

CLAIM OF PRIORITY

[0001] This application claims priority to U.S. Provisional Application 60/773,957 filed Feb. 16, 2006, entitled "Sample Sizer for Cotton Bales," the entire disclosure of which is incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a device for providing compact samples of a fibrous substance. More particularly, the present invention relates to a device for providing compact samples of cotton so that the samples can be readily stored and require a minimal amount of storage space.

BACKGROUND OF THE INVENTION

[0003] Typically, when baling cotton, samples of the lot of cotton from which the bales are being produced are kept in bags and stored for later use. For example, a perspective purchaser may utilize the samples to test the cotton being purchased for various qualities without having to test the individual bales since the cotton in the samples is representative of the baled cotton. As such, testing the cotton is facilitated in that the samples are more readily accessible and more easily handled than is the baled cotton. As well, testing the samples rather than the bales insures the integrity of any protective packaging in which the bales are stored remains intact. However, since cotton is a relatively fibrous substance and an adequate amount for testing must be retained in each sample, the sizes of the samples often require more storage space up until they are used than is desirable.

SUMMARY OF THE INVENTION

[0004] The present invention recognizes and addresses consideration of prior art constructions and methods. In one embodiment of the present invention, a device for sizing a sample of a fibrous substance includes a first compression chamber defined by a front wall, a rear wall that is parallel to the front wall, and a first and a second side wall. The first and the second side walls are transverse to the front and the rear walls such that the first compression chamber has a rectangular cross-section about a first longitudinal axis extending between a first end and a second end of the first compression chamber. A first ram is disposed at the first end of the first compression chamber and has a front surface facing the second end of the first compression chamber and is movable along the first longitudinal axis. A second compression chamber is disposed at the second end of the first compression chamber. The second compression chamber includes a second longitudinal axis that extends from a first end to a second end of the second compression chamber and is transverse to the first longitudinal axis. The second compression chamber is configured such that the front surface of the first ram forms a portion of the second compression chamber when the first ram is disposed at the second end of the first compression chamber. A second ram is disposed at the first end of the second compression chamber and has a first cross-section relative to the second longitudinal axis that is complementary to a cross-section of the second compression chamber relative to the second longitudinal axis. An extrusion nozzle has a first end and a

second end and the first end is adjacent the second end of the second compression chamber. The second end of the extrusion nozzle has a cross-section that is smaller than a cross-section of the first end of the extrusion nozzle. The sample is produced by causing the fibrous material to undergo a first compression stage in the first compression chamber and a second compression stage in the second compression chamber, the sample passing out of the device through the extrusion nozzle.

[0005] Another embodiment of the present invention includes a device for sizing a sample of a fibrous substance, including a first compression chamber defined by a front wall, a rear wall that is parallel to the front wall, and a first and a second side wall, the first and the second side walls being transverse to the front and the rear walls. A first ram is disposed at a first end of the first compression chamber and has a front surface facing a second end of the first compression chamber and is movable along a first longitudinal axis of the first compression chamber. A second compression chamber is disposed at the second end of the first compression chamber and includes a second longitudinal axis extending from a first end to a second end of the second compression chamber, the second longitudinal axis being transverse to the first longitudinal axis. A second ram is disposed at the first end of the second compression chamber and includes an unlocking piston of a first cross-section and a piston rod having a second cross-section. The unlocking piston is releasably secured to the piston rod and the first cross-section of the unlocking piston is complementary to a cross-section of the second compression chamber. The sample is produced by causing the fibrous material to undergo a first compression stage in the first compression chamber and a second compression stage in the second compression chamber.

[0006] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one or more embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended drawings, in which:

[0008] FIG. 1 is a perspective view of an embodiment of a sample sizer for cotton according to the present invention;

[0009] FIG. 2 is a front view of the sample sizer for cotton as shown in FIG. 1;

[0010] FIG. 3 is a side view of the sample sizer for cotton as shown in FIG. 1;

[0011] FIG. 4 is a top view of the sample sizer for cotton as shown in FIG. 1;

[0012] FIGS. 5A through 5F are partial, cross-sectional views of the sample sizer for cotton performing the sequence of events in which a cotton sample is produced;

[0013] FIGS. 6A and 6B are a front view and a partial side cross-sectional view, respectively, of a piston assembly in accordance with the present invention; and

[0014] FIGS. 7A and 7B are a top view and a side view, respectively, of an extrusion nozzle in accordance with the present invention.

[0015] Repeat use of reference characters in the present specification and drawings is intended to represent same or analogous features or elements of the invention according to the disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Reference will now be made in detail to presently preferred embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings. Each example is provided by way of explanation, not limitation, of the invention. In fact, it will be apparent to those skilled in the art that modifications and variations can be made in the present invention without departing from the scope and spirit thereof. For instance, features illustrated or described as part of one embodiment may be used on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0017] Referring now to the figures, in a preferred embodiment, the cotton bale sample sizer 10 includes a rectangular vertical first compression chamber 12, a first ram 14, and a side loading door 16 for loading the sample into first compression chamber 12. On top of the first compression chamber 12 and at a right angle to it is a round horizontal second compression chamber 18 and second ram 20 that compresses the sample into and through a round tapered extrusion nozzle 22 for the purpose of increasing the density and thereby reducing the volume of the sample. A control panel 11 is provided for localized control of the sample sizer 10 by the user.

[0018] The first compression ram 14 performs a single vertical reduction (FIG. 5B). The second compression ram 20 performs a two-stage reduction process. A circular unlocking piston 24 (FIGS. 6A and 6B) that is attached around a piston rod 26 of the second compression air cylinder performs the first reduction stage (FIG. 5C). Unlocking piston 24 is designed to unlock itself from piston rod 26 when compression reaches a predetermined force. This allows unlocking piston 24 to perform the first reduction stage of the second compression, thereby densifying the fiber to a near solid form. Tapered extrusion nozzle 22 is fixed to the exit end of the circular second compression chamber 18 and acts as a wedge choking the opening, thereby increasing frictional resistance. Axial and radial compressions occur simultaneously eliminating the need for an end door. Other embodiments can include a second compression chamber 18 having various cross-sections (i.e. square, polygonally shaped, etc.) and correspondingly shaped second compression ram 20.

[0019] When the unlocking piston 24 disengages from the piston rod 26, the air cylinder piston rod 26 is allowed to slide through the unlocking piston 24 (FIGS. 5D and 5E). Piston rod 26 pushes the compressed sample through extrusion nozzle 22 and exit pipe 28 and into a small polyethylene sample bag 30 that has been pre-positioned over the outside of exit pipe 28. In order to prevent piston rod 26 from becoming "wedged" in either the extrusion nozzle 22 or exit

pipe 28, piston rod 26 of the air cylinder has a smaller cross-section than both extrusion nozzle 22 and exit pipe 28. Rather than becoming wedged, cotton can fold around the end of the piston rod 26. Wedge prevention allows lower force to be utilized, hence, the cost of production may be lower than other alternatives.

[0020] After the sample is completely ejected, the second compression ram 20 retracts and the unlocking piston 24 is locked back onto the piston rod 26 as the second compression ram 20 returns to its home position and bottoms out. A gap 50 is provided between second ram 20 and second compression chamber 18 so that any cotton that gets trapped behind unlocking piston 24 when it is returned to its initial starting position can be readily removed. The first compression ram 14 then retracts to the full down position. Side loading door 16 can now be opened (as shown in FIG. 3) for the next sample. By mechanical design, side loading door 16 can only be opened when first compression ram 14 is fully retracted. This is a safety feature that prevents operation of first compression ram 14 unless side loading door 16 is closed. An electrical switch is also provided to assure that loading door 16 is closed and latched safely before motion can occur.

[0021] As best seen in FIG. 4, an external back pressure device 32 is provided at the end of the pipe 28 to prevent axial expansion of the sample during the extrusion process. An adjustable hydraulic damper 34 provides the correct amount of back pressure to control extrusion. An end stop 36 is attached to hydraulic damper 34 which allows for bagged sample removal and can be tilted out of the way as needed, as shown in FIG. 3. A sample tube 39 extends outwardly from end stop 36. Sample tube 39 is configured to be positioned over exit tube 28 and, therefore, contain the sample as it exits the tube. A spring 38 is provided to retract damper 34 after the sample is removed, which prepositions the end stop 36 for the next sample as shown in FIG. 5A.

[0022] As best seen in FIGS. 7A and 7B, a tag holder 40 is located on top of the exit pipe 28 such that the sample bag 30 can be placed over it. Tag holder 40 includes a hook end 53 that is received in a slot 54 and a catch 56 that acts as a trigger for releasing tag 52 as the sample passes through exit pipe 28. As best seen in FIG. 7B, as the lead end of the sample engages catch 56, tag holder 40 is urged upwardly so that tag 52 is no longer retained between tag holder 40 and the outer surface of exit pipe 28. As the sample exits the pipe, tag 52 is frictionally retained between the sample and sample bag 30, and thereby removed from exit pipe 28. The end of the exit pipe 28 is cut with a double 30-degree angle to control radial expansion, thereby reducing sudden bulging resulting in big-ended samples. The double angle aids in sample bag 30 placement and directs expansion favorably such that tag 52 is stripped from holder 40 during extrusion. In the preferred embodiment shown, as the sample is extracted from nozzle 22 and exit pipe 28, it is received in sample tube 39, which is pushed outwardly from the sample sizer by the sample. Once the sample is within sample tube 39, the tube is pivoted out of the way of exit tube 28 for sample removal. The worker will then twist the open end of the polyethylene bag to prevent axial expansion and will then use a tape machine commonly used in gins to seal the sample off. With end stop 36 pivoted out of the way, the next bale sample tag can be inserted under holder 40 (FIGS. 7A and 7B) and a new polyethylene sample bag 30 can be

pre-positioned over exit pipe 28 and the tag. End stop 36 can now be rotated back into position for the next sample, and as external spring 38 returns end stop 36 back into position, sample tube 39 will receive exit tube 28 and the associated sample bag 30.

[0023] In another embodiment in which there is no sample tube 39, as the sample is extruded from the nozzle, the worker can safely place one hand over the sample bag 30 and sample to remove sample from machine. It may be necessary to pivot the end stop 36 out of the way for efficient sample removal. Once the sample is removed, end stop 36 will be returned to the starting position by external spring 38.

[0024] Referring now to FIGS. 6A and 6B, preferably, unlocking piston 24 has five radial chambers 42 which contain spring 44 loaded steel balls 46 with an adjustable set screw 48 to provide force adjustment. Balls 46 are seated into a V-shaped notch 50 located around the second compression cylinder piston rod 26. Balls 46 disengage the notch 50 at a preset axial force, hence, unloading piston 24 is unlocked allowing cylinder piston rod 26 to continue pushing sample through the smaller opening in extrusion nozzle 22 and exit pipe 28.

[0025] As best seen in FIG. 6B, the face 25 of unlocking piston 24 is preferably cupped. This has been found to reduce required operating forces during compression of the sample. As well, front face 29 of piston rod 26 is preferably serrated, or toothed, such that portions of the sample are less likely to wrap around piston rod 26 during the compression stage after unlocking piston 24 has been released.

[0026] While one or more preferred embodiments of the invention are described above, it should be appreciated by those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope and spirit thereof. It is intended that the present invention cover such modifications and variations as come within the scope and spirit of the appended claims and their equivalents.

What is claimed is:

1. A device for sizing a sample of a fibrous substance, comprising:

a first compression chamber defined by a front wall, a rear wall that is parallel to said front wall, and a first and a second side wall, said first and said second side walls being transverse to said front and said rear walls such that said first compression chamber has a rectangular cross-section about a first longitudinal axis extending between a first end and a second end of said first compression chamber;

a first ram disposed at said first end of said first compression chamber, said first ram having a front surface facing said second end of said first compression chamber and movable along said first longitudinal axis;

a second compression chamber disposed at said second end of said first compression chamber, said second compression chamber including a second longitudinal axis extending from a first end to a second end of said second compression chamber, said second longitudinal axis being transverse to said first longitudinal axis, said second compression chamber being configured such

that said front surface of said first ram forms a portion of said second compression chamber when said first ram is disposed at said second end of said first compression chamber;

a second ram disposed at said first end of said second compression chamber, said second ram having a first cross-section relative to said second longitudinal axis that is complimentary to a cross-section of said second compression chamber relative to said second longitudinal axis; and

an extrusion nozzle having a first end and a second end, said first end of said extrusion nozzle being adjacent said second end of said second compression chamber and said second end of said extrusion nozzle having a cross-section that is smaller than a cross-section of said first end of said extrusion nozzle;

wherein the sample is produced by causing the fibrous material to undergo a first compression stage in said first compression chamber and a second compression stage in said second compression chamber, the sample passing out of said device through said extrusion nozzle.

2. The device of claim 1, wherein said second compression chamber further includes a semi-cylindrical wall and said front surface of said first ram is a semi-cylindrical surface such that said cross-section of said second compression chamber is circular when said first ram is disposed at said second end of said first compression chamber such that said semi-cylindrical surface is opposite said semi-cylindrical wall.

3. The device of claim 1, said second ram further comprising an unlocking piston of said first cross-section and a piston rod having a second cross-section, wherein said unlocking piston is releasably secured to said piston rod and said second cross-section of said piston rod is complimentary to said cross-section for said second end of said extrusion nozzle.

4. The device of claim 3, wherein said first cross-section of said unlocking piston is circular.

5. The device of claim 3, wherein said first cross-section of said unlocking piston is square.

6. The device of claim 3, further comprising an exit pipe disposed on said second end of said extrusion nozzle, said exit pipe having a cross-section that is complimentary to said second cross-section of said piston rod such that said piston rod can pass through said exit pipe.

7. The device of claim 6, further comprising a tag holder for releasably holding a tag adjacent an opening on a distal end of said exit pipe, said tag holder being configured to release said tag as the sample passes out of said exit pipe.

8. A device for sizing a sample of a fibrous substance, comprising:

a first compression chamber defined by a front wall, a rear wall that is parallel to said front wall, and a first and a second side wall, said first and said second side walls being transverse to said front and said rear walls;

a first ram disposed at a first end of said first compression chamber, said first ram having a front surface facing a second end of said first compression chamber and movable along a first longitudinal axis of said first compression chamber;

a second compression chamber disposed at said second end of said first compression chamber, said second compression chamber including a second longitudinal axis extending from a first end to a second end of said second compression chamber, said second longitudinal axis being transverse to said first longitudinal axis; and

a second ram disposed at said first end of said second compression chamber, said second ram having an unlocking piston of a first cross-section and a piston rod having a second cross-section, said unlocking piston being releasably secured to said piston rod and said first cross-section of said unlocking piston being complimentary to a cross-section of said second compression chamber;

wherein the sample is produced by causing the fibrous material to undergo a first compression stage in said first compression chamber and a second compression stage in said second compression chamber.

9. The device of claim 8, wherein the second compression chamber is configured such that said front surface of said first ram forms a portion of said second compression chamber when said first ram is disposed at said second end of said first compression chamber.

10. The device of claim 9, further comprising an extrusion nozzle having a first end and a second end, said first end of said extrusion nozzle being adjacent said second end of said second compression chamber and said second end of said extrusion nozzle having a cross-section that is smaller than a cross-section of said first end of said extrusion nozzle.

11. The device of claim 10, wherein said second cross-section of said piston rod is complimentary to said cross-section of said second end of said extrusion nozzle.

12. The device of claim 10, wherein said first cross-section of said unlocking piston is circular.

13. The device of claim 10, wherein said first cross-section of said unlocking piston is square.

14. The device of claim 10, further comprising an exit pipe disposed on said second end of said extrusion nozzle, said exit pipe having a cross-section that is complimentary to said second cross-section of said piston rod such that said piston rod can pass through said exit pipe.

15. The device of claim 14, further comprising a tag holder for releasably holding a tag adjacent an opening on a distal end of said exit pipe, said tag holder being configured to release said tag as the sample passes out of said exit pipe.

* * * * *